

Review of the Potential Impacts of the California
Toxics Rule on Dredging of the Sacramento River,
the Sacramento River Deep Water Ship Channel,
and the Port of Stockton Deep Water Channel

and

Beneficial Uses of Dredged Sediment for
Delta Levee Enhancement and
Shallow Water Habitat Development

G. Fred Lee, PhD, DEE

Presentation to the

Delta Levees and Habitat Advisory Committee

November 7, 1997

- What Is the California Toxics Rule (CTR)?
- What Is New in the CTR That Could Change Current Approaches to Water Quality Management?
- How Could the CTR Impact Delta Dredging?
- General Impressions of Regulatory Approaches for Delta Dredging Projects
- Regulating Beneficial Uses of Dredged Sediments
- New Areas of Regulatory Concern
Sediment Quality Criteria

HANDBOOK OF DREDGING ENGINEERING

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Lee, G. F., and Jones, R. A., "Water Quality Aspects of Dredging and Dredged Sediment Disposal," IN: Herbich, J. (ed), *Handbook of Dredging Engineering*, McGraw-Hill, NY, pp. 9-23 - 9-59 (1992).

WATER QUALITY ASPECTS OF DREDGING AND DREDGED SEDIMENT DISPOSAL*

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BACKGROUND

The dredging of U.S. waterways and harbors is recognized by Congress to be highly beneficial to the country as a whole. It is further recognized that dredging and dredged sediment disposal practices as part of waterway and harbor navigation depth maintenance will have some impact on beneficial uses and water qual-

G. Fred Lee's Expertise and Experience
in Contaminated Sediment, Dredging,
and Dredged Sediment Disposal

Academic Degrees

BA, Environmental Science, San Jose State College,
1955
MS in Public Health, University of North Carolina, 1957
PhD, Environmental Engineering, Harvard University,
1960

30 Years of University Graduate-Level Teaching and
Research in Wisconsin, Texas, Colorado, New Jersey

Over \$5 Million in Research
Published Over 500 Papers and Reports on Research

Contaminated Sediment Investigations \$2 Million
\$1 Million with Corps of Engineers Dredged Material
Research Program

Developed the Biological Effects-Based Approach for
Dredged Sediment Disposal Criteria That Is Being
Used Today to Regulate Open-Water Disposal of
Dredged Sediments

Since 1989, Full-Time Consultant in Impact-Evaluation and
Management of Water Quality, and Solid and Hazardous
Waste

For 22 Years Presented Short-Course on Managing
Contaminated Sediments Associated with Dredging Projects
at the Texas A&M University Dredging Engineering Workshop

Worked on Water Quality Criteria Development and
Implementation Since the Mid-1980s

US EPA Peer Reviewer for the Agency's Water Quality Criteria
Development Approach as Well as Several Criterion
Documents for Heavy Metals and Ammonia

Web Site:
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Published in: Dredging '94: Proceedings of the
Second International Conference on Dredging
and Dredged Material Placement, American
Society of Civil Engineers, New York, pp. 121-
130 (1994).

Contaminated Dredged Sediment Disposal Criteria

G. Fred Lee, PhD, PE, DEE (Member)¹ and Anne Jones-Lee, PhD (Member)¹

Abstract

Regulatory agencies are developing chemical concentration-based sediment quality criteria for use in the regulation of dredging projects. Gaining popularity in criteria development is any of a number of "co-occurrence" approaches, such as the AET, the Long and Morgan ER-L and ER-M values, and the MacDonald PEL values. These approaches are founded in the compilation of data on the total concentrations of selected contaminants measured in a group of sediments and some measure of a biological "effect" associated with those sediments, irrespective of the cause of the "effect." The US EPA has developed an equilibrium partitioning-based sediment quality criteria approach for some types of contaminants. It assumes that the concentration of a contaminant in the interstitial water of a sediment can be reliably estimated based on the chemical characteristics of the sediments and that the estimated concentration in the interstitial water can be related to water quality. There are significant deficiencies in the technical foundations and implementation of these and other chemical concentration-based approaches for establishing sediment quality criteria for the regulation of dredging projects. The technical foundation, assumption, and implementation issues associated with currently proposed chemical concentration-based sediment quality criteria development approaches are critically reviewed.

Introduction

In the early 1970's the Federal Water Quality Administration, an agency preceding the US EPA, developed the "Jensen criteria" for regulating dredging projects. Those criteria specified maximum bulk sediment content of a few selected parameters that are sometimes measured in domestic wastewater sludges.

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*References for this chapter section are at the end of the section.

Clean Water Act Requirements

Clean Water Act (CWA) Requires US EPA to Develop Water Quality Criteria to Protect Designated Beneficial Uses

States Must Use US EPA Criteria to Develop Water Quality Standards (Objectives)

Water Quality Standard Is a Water Quality Criterion and a Designated Beneficial Use

States Issue NPDES Permits Which Establish Maximum Concentrations of Constituents That May Be Discharged from a Permitted Source

Must Meet Ambient Water Quality Objectives at the Edge of Mixing Zone

Discharge Shall Not Be Acutely or Chronically Toxic to Aquatic Life

In 1991, the Water Resources Control Board (WRCB) Adopted Water Quality Objectives for Inland Waters, Enclosed Bays and Estuaries.

Several Cities and One Company Filed Suit Against the Board for Failing to Incorporate Porter-Cologne-Required Economic Considerations—Court Overturned Water Quality Plans and Objectives

1987 Revisions of the Clean Water Act Require That the US EPA Force All States to Adopt Water Quality Standards for Selected Toxics Constituent - Priority Pollutants

Basic Problem Has Been That US EPA's Development of Water Quality Criteria Is Based On Worst-Case Assumptions with Respect to Impacts on Aquatic Life

Utilize Lake Superior's Water Characteristics and 100% Available Forms of Toxic Chemicals

In the Real World, Few Waterbodies Have Characteristics of Lake Superior (Where the US EPA Duluth Lab That Develops Freshwater Criteria Is Located) and Rarely Are the Constituents of Concern in 100% Toxic/Available Forms

Particulate Forms of Constituents Are Non-Toxic/Unavailable

Part of the Dissolved Forms of Some Constituents are Non-Toxic/Unavailable

There Is No Reliable Way to Estimate the Toxic/Available Forms Based on Chemical Measurements

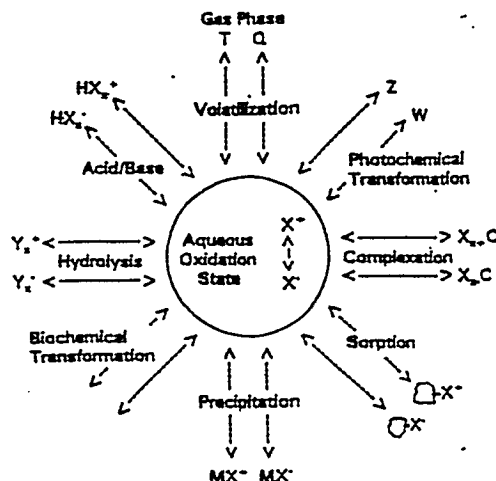
US EPA Water Quality Criteria Including the CTR Proposed Criteria, Are Generally Over-Protective

US EPA Water Quality Control Criteria Are Developed for Extended Exposures of Aquatic Life to Toxicants But They Are Implemented Based on a Four-Day Average and One-Hour Average for Acute and Chronic Toxicity

The One-Hour (Acute) and Four-Day (Chronic) Averages Were Arbitrarily Developed and Tend to Significantly Over-Regulate Most Chemical Constituents.

Much Longer Periods of Time of Exposure to Toxic/Available Forms Can Occur without Adverse Impacts

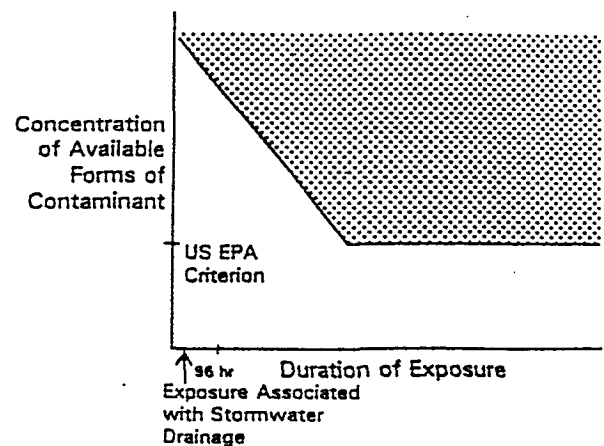
Aquatic Chemistry of Chemical Contaminants



Distribution Depends on Kinetics & Thermodynamics of Reactions in a Particular Aquatic System

Each Chemical Species Has Its Own Toxicity Characteristics
Many Forms Are Non-Toxic

Aquatic Toxicology



US EPA Criteria List 1-hr-Average Maxima and 4-day-Average Maxima

Not Valid for Assessing Potential Impacts of Urban Stormwater Drainage